

REMARKS/ARGUMENTS

The Applicants respectfully request reconsideration of this Application. The Applicants originally submitted Claims 1-20 in the Application. Pursuant to a restriction requirement, the Applicants elected to prosecute Claims 1-15 (Group 1) in the present Application, pending the filing of a Divisional Application prosecuting Claims 16-20 (Group 2). The Applicants have previously amended Claim 10 and have added Claim 21 in the present Application. By this Amendment, the Applicants amend Claim 1. Accordingly, Claims 1-15 and 21 are currently pending in the Application.

I. Rejection of Claims 10, 12 and 15 under 35 U.S.C. §102

The Examiner has rejected Claims 10, 12 and 15 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,187,680 to Costrini, *et al* (Costrini). The Applicants respectfully assert that Costrini does not anticipate independent Claim 10. More specifically, Costrini does not disclose bonding a wire onto the passivation layer, wherein a portion of the passivation layer forms a metallurgical bond with the bond pad and wherein a mechanical and electrical connection is provided between the bond pad and the wire, with the passivation layer disposed therebetween. In contrast, Costrini discloses a passivation layer formed over a bond pad, and then etching away a portion of the passivation layer directly over the bond pad. Then, Costrini discloses forming a barrier layer in place of the etched passivation layer and in direct contact with the bond pad, with an aluminum stack formed over the barrier layer. Costrini then bonds a wire to the aluminum stack, rather than bonding the wire directly to the passivation layer, as recited in Claim 10. Moreover, even if the aluminum stack of Costrini were read to be the passivation of the present invention, such that the wire were directly bonded to the passivation layer, then Costrini would not disclose a

portion of that "passivation layer" forming a metallurgical bond with the bond pad, as recited by independent Claim 10, since the barrier layer would be the layer in contact with the bond pad. As a result, Costrini does not anticipate Claim 10.

In conclusion, Costrini does not disclose the above-mentioned elements recited by independent Claim 10, and, therefore, is not an anticipating reference of Claim 10. In addition, dependent Claims 12 and 15 depend from Claim 10; thus, Costrini is also not an anticipating reference for these dependent claims. Accordingly, the Applicants respectfully request the Examiner withdraw the §102 rejection with respect to Claims 10, 12 and 15.

II. Rejection of Claims 1-4, 6-9, 11, 14 and 21 under 35 U.S.C. §103

The Examiner has rejected Claims 1-4, 6-9, 11, 14 and 21 under 35 U.S.C. §103(a) as being unpatentable over Costrini as applied to Claims 10, 12 and 15 above, and further in view of the Examiner's official notice that aluminum is commonly used for wire and that heating a wire-bonded structure is well known. In spite of the Examiner's official notice, the Applicants respectfully disagree with the Examiner's belief that the combination of Costrini and the official notice render the claimed inventions obvious. More specifically, as discussed above, Costrini does not disclose bonding a wire onto a passivation (tantalum) layer, wherein a portion of the passivation layer forms a metallurgical bond with the (copper) bond pad and wherein a mechanical and electrical connection is provided between the bond pad and the wire, with the passivation layer disposed therebetween, as recited in independent Claims 1 and 10. Therefore, irrespective of the official notice, Costrini does not teach or suggest the above-mentioned elements of Claims 1 and 10 of the present invention.

Furthermore, since Costrini explicitly teaches depositing and bonding a barrier layer onto an etched bond pad and an aluminum stack over the barrier layer, then bonding a wire to the aluminum stack rather than the barrier layer, one who is skilled in the pertinent art would find no motivation in Costrini to take the necessary steps to arrive at the inventions of Claims 1 and 10, and their dependent claims, when considered as a whole. In contrast, Claims 1 and 10 teach connecting a wire directly to a passivation layer, which forms a metallurgical bond with a bond pad, to make the electrical connection from the wire to the bond pad. Because the deposition of an aluminum stack over the barrier layer is imperative to the teachings found therein, there is no motivation in Costrini for one who is skilled in the art to modify Costrini to arrive at the claimed invention.

In conclusion, the combination of Costrini and the Examiner's official notice fails to teach or suggest the inventions recited in independent Claims 1 and 10 and their dependent claims, when considered as a whole. The combination, therefore, does not establish a *prima facie* case of obviousness of Claims 1-4, 6-9, 11, 14 and 21, and the Applicants respectfully request the Examiner withdraw the §103(a) rejection with respect to these claims.

The Examiner has also rejected dependent Claims 5 and 13 under 35 U.S.C. §103(a) as being unpatentable over Costrini in view of the cited article by Harper. The Applicants respectfully assert that the claimed invention is nonobvious in view of the foregoing combination of references, and that a *prima facie* case of obviousness of dependent Claims 5 and 13 is not established. More specifically, as discussed above, Costrini does not teach, or even suggest, the above-mentioned elements recited in independent Claims 1 and 10. Since Costrini fails to teach or suggest these missing elements of Claims 1 and 10, a *prima facie* case of obviousness of dependent Claims 5 and 13, which include the elements of Claims 1 and 10, respectively, cannot be established. Moreover, as presented, Harper does nothing to cure to the deficiencies of Costrini. Rather, Harper is merely

offered for the assertion that wedge bonding of semiconductor devices is well known, and not to form a basis of rejection for independent Claims 1 and 10. Accordingly, the Applicants respectfully request the Examiner also withdraw the §103 rejection of dependent Claims 5 and 13.

III. Conclusion

The Applicants respectfully request that the rejections be withdrawn and solicit a Notice of Allowance for Claims 1-15 and 21. The Applicants further attach hereto a marked-up version of the amendments made to the claims. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

Respectfully submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 1 has been amended as follows:

1. (Amended) A wire bonding method, comprising the steps of:
forming a semiconductor substrate with a copper (Cu) interconnect material;
fabricating a copper (Cu) bond pad from the interconnect material;
depositing a tantalum (Ta) layer onto the substrate and over the bond pad;
patterning and etching the tantalum (Ta) layer; and
bonding an aluminum (Al) wire [with] to the tantalum (Ta) layer over the bond pad;
wherein a portion of the tantalum (Ta) layer [bonds] forms a metallurgical bond with the
copper (Cu) bond pad, and another portion of the tantalum (Ta) layer forms a tantalum aluminide
(TaAl₃) compound to bond with the aluminum wire.

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